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COSMOGHILUS CARDINALIS, A NEW CYPRINID FISH FROM
THE LANCANG-JIANG OR MEKONG RIVER IN
YUNNAN PROVINCE, CHINA

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ABSTRACT: *Cosmochilus cardinalis* is a large, deep-bodied cyprinid fish recently discovered in southern Yunnan Province in the mainstream of the Lancang-jiang or Mekong River. It is distinguished from all other cyprinids in China and Southeast Asia in having all of its fins bright red; it is further distinguished from the two previously known species of *Cosmochilus* by having longer barbels, reduced labial papillae, a concave nape, more numerous scales (also more numerous vertebrae?) and nine instead of eight branched dorsal fin rays.

INTRODUCTION

In the present paper we describe a distinctive new species of large cyprinid fish from the Mekong River or Lancang-jiang of China. The type-specimens were collected during an ongoing, long-term ichthyological survey of Yunnan Province undertaken by the Kunming Institute of Zoology of Academia Sinica.

The Lancang-jiang or Mekong is the largest river in Southeast Asia and probably has the richest ichthyofauna of any river in Asia. It is some 4300 km long and arises at an elevation of 5090 m below an enormous glacier on the northern slopes of the Dza-Nag-Lung-Mung or Tanglha Range of the Tibetan highlands of China's Tsinghai Province. In Tibet it is known as the Lan-

cang-jiang or Dza Chu. It leaves Tibet and enters Yunnan Province at an elevation of about 2800 m, assuming a generally southerly course of nearly 900 km through mountainous and hilly country of Yunnan. In its upper reaches in Tibet and Yunnan it flows through canyonlike gorges between and parallel to the Salween and Yangtze. In lower Yunnan, where the new species of cyprinid was collected, the elevation is only about 500 m. Here the river has a relatively gentle gradient and moderate current and is about 150 m wide during the dry season. The bottom is rocky in places but predominantly muddy. The local fishermen know the new species as bia liang or hong chi ("red-finned fish"). We have identified it as an undescribed *Cosmochilus*.

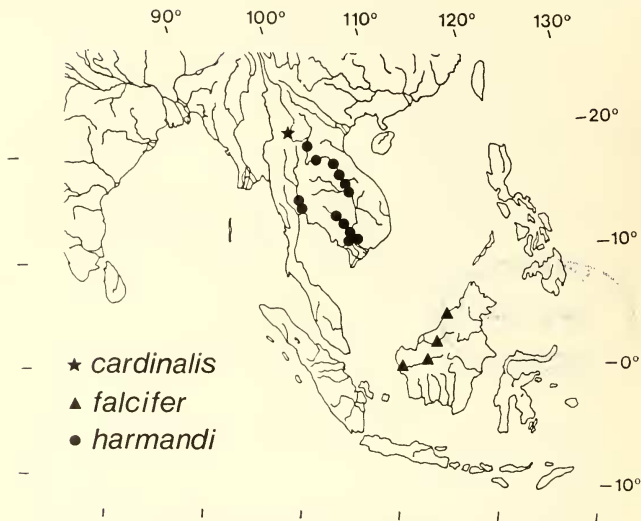


FIGURE 1. Geographical distribution of the species of *Cosmochilus*.

Cosmochilus Sauvage, 1878

Cosmochilus SAUVAGE, 1878:240 (type-species *Cosmochilus harmandi* SAUVAGE, by monotypy).

DIAGNOSIS.—Large, deep-bodied and laterally compressed labeoine cyprinids; dorsal fin large and falcate, with 4 simple and 8–9 branched rays; last simple dorsal fin ray greatly enlarged, its posterior border more or less strongly serrated for its entire length; anal fin relatively small, with 3 simple and 5–6 branched rays; head relatively small, compressed; snout truncate, without enlarged tubercles or pores; mouth small and inferior, its opening transverse; rostral and maxillary barbels large and relatively elongate; lips moderately thick, entirely covered with large, contiguous papillae; horny jaw sheaths transverse, moderately thick but with relatively weak cutting edge; gill rakers fleshy, relatively unsp-

cialized, 15–18 on first gill arch; pharyngeal teeth triserial, morphologically generalized for Cyprinidae, usually 1,3,5/5,3,1 or 2,3,5/5,3,2; lateral line almost perfectly straight; each lateral line tubule with a short ventroposterior branch terminating in a small pore on exposed portion of posterior shield; scales in lateral line series 35–48; circumpeduncular scales 16–18; scales oblong, with relatively huge posterior shields; radii of posterior shield strongly convergent; radii of anterior shield frequently conjoined or bifurcate; vertebrae 35–43.

In addition to *C. harmandi* from the Chao Phrya and Mekong rivers, the genus includes *C. falcifer* Regan, 1906 from the Baram and Rejang rivers in Sarawak and Kapuas in Kalimantan Barat (western Borneo). The distribution of the species is shown in Figure 1. *Cosmochilus harmandi* is known to undertake lengthy spawning

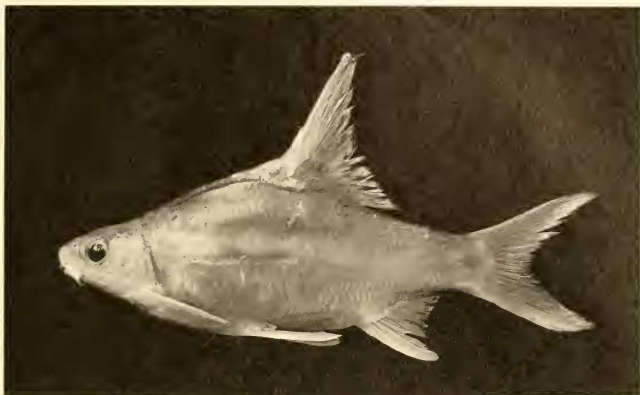


FIGURE 2. *Cosmochilus cardinalis*, holotype (KIZ 735113, 177 mm).

migrations. This is suspected in *C. falcifer*, and thus may also be characteristic of *C. cardinalis*. Mekong localities for *C. harmandi* are from Rainboth et al. 1976.

Cosmochilus cardinalis new species

(Figures 2-5)

HOLOTYPE.—KIZ (Kunming Institute of Zoology) 735113, 177 mm (standard length), mainstream of Lancang-jiang near Jinghong, southern Yunnan Province, lat. 21°50'N, long. 100°55'E, gill net, May 1973.

PARATYPES.—KIZ 734079-80, 734082, 735107, 735109-112, 735025, 735030, 735075, 735160, 12: 165-326 mm, same locality and collecting method as holotype, April-May 1973.¹

DIAGNOSIS.—A large, deep-bodied, and laterally compressed *Cosmochilus*, attaining at least 400 mm standard length. Rostral and maxillary barbels relatively long and thick, dorsal fin high with a falcate margin and elevated base; dorsal fin rays iv9-1/2, last simple ray an elongate stiff spine strongly serrate posteriorly; anal fin rays iii6-1/2. It differs from all or almost all other cyprinids in China and Southeast Asia in having all of the fins including the pectoral and pelvic

and both caudal lobes entirely bright cardinal red in life. Body dusky dorsally, silvery or whitish on sides and abdomen. Opercle golden. Scales in lateral series 46-48, between dorsal fin and lateral line 9-10, between lateral line and pelvic fin origin 5, circumpeduncular 16-18. Vertebrae 24 + 19 = 43 (holotype).

Head relatively small and laterally compressed, its length 4.0-4.5; dorsal profile of head to nape moderately sloped, then abruptly steeper at nape until dorsal fin origin. Snout 2.7-3.2 in head, eye 4.1-5.3 in head, interorbital width 2.4-2.7 in head. Eye with a narrow gelatinous rim or hyaline eyelid. Barbels thick and relatively long; anterior or rostral barbel extending posteriorly almost to below posterior border of eye, its length 1.8-2.2 in head; posterior or maxillary barbel somewhat longer, extending posteriorly almost to pectoral fin, its length 1.4-1.7 in head. Mouth subinferior and moderately wide, extending posteriorly to directly below anterior margin of eye or slightly farther. Rostral cap well developed with deeply incised rostral groove complete between rostral barbels of either side. Sublacrimar groove also well developed and deeply incised, extending from rostral barbel to posterior end of jaws. Lips moderately well developed; upper lip

¹ KIZ 735111, 251 mm, has been transferred to the Ichthyology Department collection of the California Academy of Sciences and is now CAS 55592.

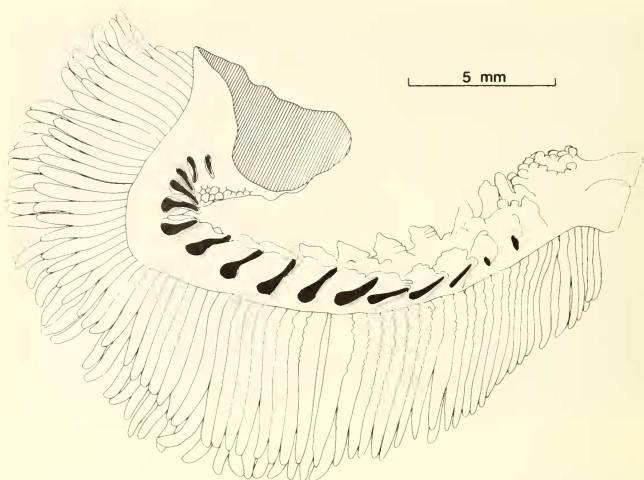


FIGURE 3. *Cosmochilus cardinalis*, holotype. First gill arch (lateral view; bony supports of gill rakers in black).

well defined, entirely separate from rostral cap and upper horny jaw sheath; lower lip with oral margin separated from horny jaw sheath only by a shallow groove, and with posterior margin well defined laterally but entirely interrupted for transverse portion of lower jaw; upper and lower horny jaw sheaths well developed, with a broadly rounded surface and very weakly developed transverse grooves or sulci. Anterior margin of lower jaw truncate.

Rostral cap and horny jaw sheaths relatively smooth; lips and oral epithelium (including gular flap) covered with large, close-set or contiguous but low-lying papillae (probably unculiferous) comparable in distribution and basic morphology to the greatly enlarged and elevated contiguous papillae characteristic of the other two species of *Cosmochilus*.

Gill openings relatively broad, isthmus narrow; upper portion of gill cover with posterior margin very slightly concave. First gill arch (Fig. 3) with 5 + 11 or 12 = 16 or 17 gill rakers on

anterolateral margin and 0 + 11 gill rakers on posterodorsal margin in holotype; paratypes with 17-19 anterolateral gill rakers on first gill arch. Gill rakers all relatively short and fleshy, those on lower limb of gill arches more or less triangular in shape with broad bases; posterior gill rakers similar in shape to anterior rakers but relatively somewhat larger. Pharyngeal bones (Fig. 4) strongly arched; dorsal edentulous limb and dorsal half of toothbearing portion thick and evenly curved; external ala moderately broad; edentulous lower limb and ventral half of toothbearing portion below external ala with concave lateral margin. Entire medial surface of lower limbs of either pharyngeal bone forming a broad symphysis. Pharyngeal teeth basically uncinata, 2,3,5/4,3,2 in holotype, those of principal row compressed.

Scales (Fig. 5) large, slightly longer than high, and relatively numerous. Anterior margin relatively straight but with a well defined convex median projection; posterior margin broadly

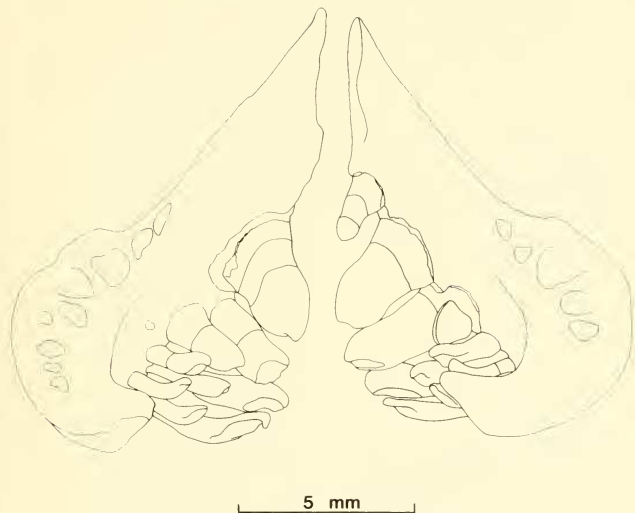


FIGURE 4. *Cosmochilus cardinalis*, holotype. Pharyngeal jaws (dorsal view).

rounded; radii most numerous and longest on posterior field, least numerous and shortest on lateral fields; radii near central portion of posterior field strongly convergent. Lateral line complete and nearly straight. Scales of lateral line with straight primary tubules and a single small pore arising from a short ventroposteriorly directed secondary tubule originating from anterior half of primary tubule. Scales in lateral line series 46–48, 9–10 above and 5 below lateral line; predorsal scales 24–26, circumpeduncular 16–18. Two or three scale rows extend on caudal fin base posterior to last pored scale of lateral line series. Scales between vent and anal fin origin 2. Circumferential scales 35–37 (18–20 dorsal + 2 lateral line + 15 ventral).

Dorsal fin origin near middle of body, somewhat closer to snout tip than to caudal fin base. Anal fin origin distinctly posterior to vertical through base of last dorsal fin ray. Pelvic fin or-

igin well in advance of vertical through dorsal fin origin. Base of dorsal fin with well developed, strongly convex scale sheath comprising three somewhat irregular rows of large scales (of which the middle row is somewhat smaller); anal fin scale sheath only slightly convex, with one or two rows of scales. Pelvic fin with two moderately elongate axillary scales. Dorsal fin spine length 3.0–3.7, with 20 serrae in holotype. Anal fin much smaller than dorsal fin, with last simple and first two branched rays slightly prolonged to form a lobe. Pectoral and pelvic fins almost equal in shape and size, pectoral fin extending posteriorly almost to pelvic fin origin and pelvic fin reaching or almost reaching vent; pectoral fin length 3.8–4.3, pelvic 4.0–4.3. Pectoral fin rays usually 15, pelvic 9. Caudal fin deeply forked, upper and lower lobes nearly equal in length and shape, with slightly pointed tips.

Abdomen anterior to and between pelvic fins

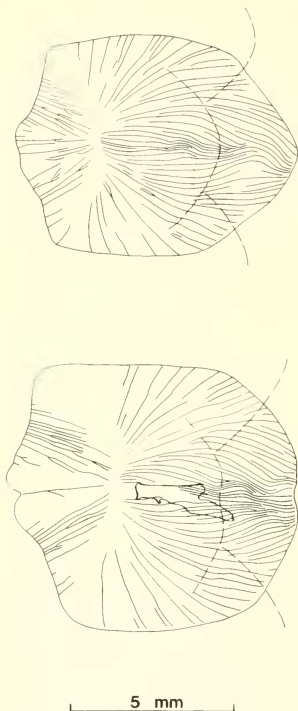


FIGURE 5. *Cosmochilus cardinalis*, holotype. Scales. Below, 30th scale in lateral line scale series. Above, scale two scale rows about 30th scale in lateral line scale series. Dashed lines indicate areas of overlap by scales neighboring exposed portion of posterior shield.

somewhat flattened from side to side; abdomen posterior to pelvic fins rounded or very slightly (almost imperceptibly) carinate. Body depth 2.4. Caudal peduncle laterally compressed and moderately deep, its length 6.1–7.9 and depth 6.4–

7.2. Dorsal surface of head and lateral surface of lacrimal region more or less uniformly covered with fine, widely spaced granular tubercles; stronger tuberculation or tubercles on fins not observed in specimens of either sex. Swim bladder with two chambers. Intestine about three times as long as body.

COMPARISON WITH OTHER SPECIES OF *COSMOCHILUS*.—The basically similar morphology of the scales, scaly fin sheaths, fleshy gill rakers, pharyngeal teeth, and papillose lips of *C. cardinalis*, *C. harmandi*, and, so far as known, *C. falcifer*, leads us to conclude that the three are correctly placed together within *Cosmochilus*.

Our new species differs from *C. harmandi* and *C. falcifer* in having more numerous scales (44–48 vs. 36–39 in lateral series), three instead of two scale rows in scaly sheath on dorsal fin base, 9 instead of 8 branched dorsal fin rays, dorsal profile strongly concave at nape (vs. relatively evenly sloped), more elongate barbels, labial papillae much reduced in size, and all fins bright red. It additionally differs from *C. harmandi* in having 6 instead of 5 branched anal fin rays, a less pointed snout viewed from above or from the side, and 43 instead of only 35 vertebrae (number of vertebrae unknown in *C. falcifer*). *Cosmochilus cardinalis* also differs from *C. falcifer* in having the fourth simple dorsal fin ray relatively less elongate, very straight, and with large, strong serrae on its posterior margin. In *C. falcifer* this ray is exceptionally elongate (sometimes extending posteriorly to caudal fin base when adpressed), very strongly curved, and with very weak serrae on its posterior margin.

Life color of *C. harmandi* is recorded as back rich pale blue, dorsal and caudal fins black-edged; in some specimens anal fin with black tip (Smith 1945:132). We note that the dorsal fin may also be black-tipped. Life color of *C. falcifer* has not been reported previously. A fresh 316-mm specimen caught in the Kapuas and photographed in the market at Sintang by the junior author had overall color white or milk white, especially ventrolaterally and ventrally; dorsolaterally and dorsally distinctly brownish or violaceous brown; posterior margins of scales, especially on upper parts of body, with broad dark margins; dorsal surface of head faintly yellowish and entire gill cover distinctly yellow; iris and ventral portion of head milk white; entire dorsal fin rosy pink or faintly orangish except black at tip; pectoral fin

white, pelvic white or pinkish; anal and caudal fins dusky, caudal very dark, its posterior margin almost black.

In conclusion, *C. harmandi* and *C. falcifer* seem to be much more similar to each other than either of them is to *C. cardinalis*.

RELATIONSHIPS OF *COSMOCHILUS*

Sauvage (1878:240) stated that *Cosmochilus* is related to *Labeo* but did not discuss this assessment. The pattern of strongly convergent radii on the posterior shield and conjoined or bifurcating radii on the anterior shield of the scales of *Cosmochilus* is seen in relatively few Chinese cyprinids (Chu 1935). Those in which this pattern is most clearly present are species of *Osteochilus*, *Sinilabeo*, and *Garra* (Chu 1935, pls. 15-16). These genera are referable to the cyprinid subfamily Labeoinae. We have observed scales with a similar pattern of radii in various non-Chinese Labeoinae including *Morulus chrysophekadion* and various African and Asian species currently assigned to *Labeo*, but not in genera belonging to other subfamilies. This suggests that *Cosmochilus* might indeed belong in Labeoinae. On the other hand, the general morphology of *Cosmochilus*, including the relatively simple mouth parts; deep, laterally compressed body;

and elongate, serrate dorsal fin spine suggest relationship to a group of Southeast Asian barbels including *Cyclocheilichthys*. A serrate dorsal fin spine is unknown in the Labeoinae.

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